

MINISTRY OF EDUCATION AND TRAINING
QUY NHON UNIVERSITY

MASTER'S PROGRAM

Level of education: **Master's**
Major: **Mathematical Analysis**
Code: **8460102**
Training orientation: **Research**
Type of education: **Full-time**

Binh Dinh, 2025

MASTER’S PROGRAM

(Issued together with Decision No. 1295/QĐ-DHQN dated April 29, 2025

of the Rector of Quy Nhon University)

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1. PROGRAM OBJECTIVES (POs)

1.1. General objectives

The training program equips learners with political qualities and professional ethics; strong professional competence and mastery of specialized knowledge in Analytical Mathematics; critical thinking skills, the ability to self-study and conduct in-depth research to acquire new knowledge; the potential to pursue doctoral-level education; and the ability to apply mathematics to solve practical problems arising from teaching and research activities in mathematics.

1.2. Specific objectives

Master's Degree in Analytical Mathematics with a Research Orientation Capabilities:

- Knowledge

- + **PO1:** Possess solid knowledge of political science and Marxist-Leninist philosophy, applying it in professional activities and life.
- + **PO2:** Have advanced knowledge of foundational mathematics in the field of Analytical Mathematics to further study specialized knowledge and enhance academic qualifications.
- + **PO3:** Possess deep and broad specialized knowledge in various areas of Analytical Mathematics to apply in solving problems in teaching mathematics at universities, colleges, and high schools according to the new general education curriculum.

- **Skills**

- + **PO4:** Have the skills to apply advanced mathematical knowledge learned to solve practical problems arising from teaching mathematics.
- + **PO5:** Possess critical thinking, analytical, and synthesis skills, along with the ability to self-study and conduct in-depth research to acquire new knowledge.
- + **PO6:** Have skills for independent work, teamwork, and organizing group work; possess self-learning and self-reading skills to identify and solve problems; engage in lifelong learning and research.

- **Autonomy and Responsibility**

- + **PO7:** Self-awareness and a clear understanding of the importance of self-learning and self-reading to identify and solve problems; pursue advanced studies and lifelong research.
- + **PO8:** Demonstrate professional ethics, personal responsibility, and responsibility towards the group, community, and society; be accountable for work and the environment.

2. EMPLOYMENT OPPORTUNITIES AND FURTHER STUDY ROSPECTS

Graduates of the research-oriented Master's program in **Mathematical Analysis** are qualified to:

- **Teaching:** Teach at high schools (upper and lower secondary schools), as well as at universities and colleges across the country;
- **Management:** Work as specialists or academic administrators at educational institutions and education management agencies;
- **Research:** Work as research staff in mathematics institutes, research centers, universities, and colleges;
- **Doctoral Studies:** Continue their studies in doctoral (PhD) programs;
- **International Education:** Pursue further studies abroad through international postgraduate programs.

3. LEARNING OUTCOMES

Program Learning Outcomes (PLOs)

The program is designed to ensure that graduates achieve the following learning outcomes:

3.1. Knowledge

+ **Fundamental Knowledge**

- 1) **PLO1:** Understand and apply knowledge of political science and **Marxist–Leninist philosophy**, and apply it in professional activities and daily life.

- 2) **PLO2:** Possess a broad and in-depth understanding of the fundamental knowledge of **Mathematical Analysis, Algebra, Number Theory, Geometry, Optimization, and Probability**, and be able to apply this knowledge for advanced study and to adapt effectively to the frequent changes in the new general education curriculum, as well as to teaching and research in mathematics.

+ **Socialized Knowledge of the Discipline**

- 3) **PLO3:** Possess comprehensive and in-depth knowledge and mastery of **Mathematical Analysis**, and be able to apply this specialized knowledge to solve problems in mathematics teaching at universities, colleges, and high schools in accordance with the new general education curriculum.
- 4) **PLO4:** Apply integrated knowledge from fundamental, foundational, and specialized courses together with self-acquired knowledge to professional activities such as: training gifted students, teaching specialized mathematics classes, conducting in-depth research in school mathematics and elementary mathematics, participating in professional development programs and thematic workshops for school teachers, and developing new knowledge.

3.2. Skills

+ **General Skills**

- 5) **PLO5:** Demonstrate and apply skills in critical thinking, analysis, synthesis, and scientific evaluation of data and information; possess teamwork skills to accomplish common professional objectives.

+ **Professional Skills**

- 6) **PLO6:** Apply the ability to identify and utilize learned mathematical knowledge for teaching and advanced research in **Mathematical Analysis**.
- 7) **PLO7:** Apply mathematical research skills, innovation, creativity, and appropriate technologies in the field of mathematics.
- 8) **PLO8:** Demonstrate proficient and creative skills in disseminating mathematical knowledge to learners and guiding students in completing learning tasks.

3.3. Autonomy and Responsibility

- 9) **PLO9:** Be able to work independently or collaboratively in changing working environments, take personal and team responsibility, and guide and supervise learners in carrying out learning tasks.
- 10) **PLO10:** Be capable of self-orientation and adaptation to evolving teaching environments, making professional conclusions, and defending personal viewpoints; have the ability to

plan, coordinate, manage resources, evaluate and improve the effectiveness of professional activities; and be able to continue advancing academically through self-study or doctoral programs at universities and research institutions both domestically and internationally.

4. ADMISSION REQUIREMENTS

Applicants must meet the following criteria:

- Applicants must have **graduated from a bachelor’s program or have met the requirements for recognition of a bachelor’s degree (or an equivalent or higher qualification)** with at least a **Good classification**, or have **scientific publications related to the field of Mathematical Analysis**.
- Applicants must possess **foreign language proficiency at Level 3 or higher according to the 6-level Foreign Language Proficiency Framework for Vietnam, or an equivalent qualification**.

Applicants holding a bachelor’s degree in a relevant field:

No.	Intended Master’s Major	Relevant Undergraduate Major	Note
1	Mathematical Analysis	<ul style="list-style-type: none"> - Mathematics Education (7140209) - Mathematics (7460101) - Applied Mathematics (7460112) - Mathematics and Computer Science (7460117) - Mathematics and Mechanics (7460115) 	

Applicants whose undergraduate majors require supplementary knowledge: The list of relevant majors and the required supplementary courses is as follows:

No.	Intended Master’s Major	Majors Requiring Supplementary Courses	Supplementary Courses (Number of Credits)	Note
1	Mathematical Analysis	<ul style="list-style-type: none"> - Statistics (7460201); - Computer Science Education (7140210); 	<ul style="list-style-type: none"> - Linear Algebra (3 credits) - General Algebra (3 credits) 	Depending on the specific case, the Department will determine the number of required

		- Other majors will be considered on a case-by-case basis	- Multivariable Analysis (3 credits) - Measure Theory and Integration (3 credits) - Functional Analysis (3 credits)	supplementary courses.
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5. ADMISSION TARGETS

In accordance with the current Regulations on Admission and Master's level training issued by Quy Nhon University and the Ministry of Education and Training.

6. PROGRAM DURATION AND TOTAL CREDIT REQUIREMENTS

6.1. Program Duration: 2 years

6.2. Total Credit Requirements: 60 credits (*including 12 credits for research seminars and 12 credits for the master's thesis*).

Curriculum Structure	Number of Credits
General Knowledge	3
Fundamental and Specialized Knowledge	45
Compulsory courses	27
Optional courses	6
Research Topics	12
Master's Thesis	12
Total credits	60

7. TRAINING METHOD, GRADUATION REQUIREMENTS

7.1. Training method

The training is organized under the credit-based system in accordance with the current regulations of the Ministry of Education and Training and of Quy Nhon University.

7.2. Graduation Requirements

In accordance with the current regulations of the Ministry of Education and Training and of Quy Nhon University:

a) Having completed all courses in the training program and successfully defended the master's thesis;

b) Meeting the foreign language proficiency requirement according to the program's learning outcomes before the time of graduation consideration; this must be evidenced by one of the following: a diploma or a foreign language certificate equivalent to **Level 4** of the **Vietnamese 6-level Foreign Language Proficiency Framework** specified in the Appendix of this Regulation, or other equivalent certificates announced by the Ministry of Education and Training; or a bachelor's degree or higher in a foreign language major; or a bachelor's degree or higher in another major whose program was conducted entirely in a foreign language;

c) Having fulfilled all responsibilities prescribed by Quy Nhon University; not being subject to criminal prosecution and not being under disciplinary action or suspension from study.

7.3. Degree Awarded

Vietnamese: BẰNG THẠC SĨ TOÁN GIẢI TÍCH

English: THE DEGREE OF MASTER IN MATHEMATICAL ANALYSIS

8. ASSESSMENT METHODS, GRADING SCALE

8.1. Grading scale

A 10-point scale is used for all forms of assessment within the course.

8.2. Format, evaluation criteria, and scoring system

- Assessment of theoretical courses

No	Format	Evaluation criteria	Weighting
1	<i>Progress assessment</i>	<p><i>Attendance:</i> Students must attend all required sessions and must not miss more than 20% of the total class hours.</p> <p><i>Discussion:</i> Proactiveness, level of preparation, and active participation in classroom activities.</p> <p><i>Homework:</i> Students complete one or more assignments at home. Instructors assign specific tasks to individual students or groups of students.</p>	40%, 30%

		<p>Mid-term Assessment: Choose one of the following forms and evaluation criteria:</p> <ul style="list-style-type: none"> - In-class Test: Students complete a test in class; the instructor will specify the detailed evaluation criteria. - Seminar or Capstone Project: Students conduct a seminar or complete a major assignment (capstone project) as required by the course instructor. Evaluation criteria for reports, seminars, and projects will be specified by the instructor. 	
2	Final examination	<p>Evaluation criteria are based on the selection of one of the following examination formats:</p> <ul style="list-style-type: none"> - Written Examination: Students complete a final written exam. The instructor will specify the content and evaluation criteria within the answer key and grading scheme of the final exam. - Oral Examination: Evaluation criteria are determined by the examining board based on the student's attitude and the quality of their responses. - Term Paper (Essay): Evaluation criteria are based on the content and quality of the submitted report. 	60%, 70%

- Assessment of Research topics

Evaluation criteria are specified in the **detailed syllabus** of each research topic.

- Assessment of Master's Thesis

Conducted in accordance with the current Regulations on Admission and Master's Level Training of Quy Nhon University.

8.3. Assessment methods

The assessment methods used in the Master's program in Algebra and Number Theory are categorized into two main types: Formative Assessment (Progress assessment) and Summative

						Prac- tise	cal/Di scussi onal		
I. General Knowledge									
I.1. Philosophy									
1	TNTH	501	Philosophy	1	3	3			Department of Political Theory, Law, and Public Administration
II. Fundamental and Specialized Knowledge									
II.1. Compulsory									
2	CSBB	502	Advanced Linear Algebra	1	3	3			Department of Mathematics and Statistics
3	CSBB	503N	Advanced Algebra	1	2	2			Department of Mathematics and Statistics
4	CSBB	504	The theory of functions of real variables	1	3	3			Department of Mathematics and Statistics
5	CSBB	505N	Probability Theory	1	2	2			Department of Mathematics and Statistics
6	CSBB	506N	Introduction to Algebraic Geometry	2	2	2			Department of Mathematics and Statistics
7	CSBB	507N	Applied Functional Analysis	2	2	2			Department of Mathematics and Statistics

8	CSBB	508N	Complex Analysis with Applications	2	2	2			Department of Mathematics and Statistics	
9	CSBB	509	Optimization Theory	2	3	3			Department of Mathematics and Statistics	
10	GTBB	510N	Partial differential equations	2	2	2			Department of Mathematics and Statistics	
11	GTBB	511N	Convex Analysis	3	2	2			Department of Mathematics and Statistics	
12	GTBB	512N	Dynamical systems and control theory	3	2	2			Department of Mathematics and Statistics	
13	GTBB	513N	Fourier analysis and applications	3	2	2			Department of Mathematics and Statistics	
II.2. Optional (select 03/12 courses)										
14	GTTC	514	Harmonic analysis	3	2	2			Department of Mathematics and Statistics	
15	GTTC	515	Special Functions	3	2	2			Department of Mathematics and Statistics	
16	GTTC	516	Hyperbolic dynamical systems	3	2	2			Department of Mathematics and Statistics	
17	GTTC	517	Stochastic Analysis	3	2	2			Department of	

									Mathematics and Statistics	
18	GTTC	518	Integral Transforms	3	2	2			Department of Mathematics and Statistics	
19	GTTC	519	Numerical methods for solving systems of equations	3	2	2			Department of Mathematics and Statistics	
20	GTTC	520	Theory of Distributions	3	2	2			Department of Mathematics and Statistics	
21	GTTC	521	Optimal Control Theory	3	2	2			Department of Mathematics and Statistics	
22	GTTC	522	Applied Statistics	3	2	2			Department of Mathematics and Statistics	
23	GTTC	523	Topological degree theory and applications	3	2	2			Department of Mathematics and Statistics	
24	GTTC	524	Variational Analysis	3	2	2			Department of Mathematics and Statistics	
25	GTTC	525	Operator Theory	3	2	2			Department of Mathematics and Statistics	
II.3. Other Research Topics										
26	GTCD	526	Research Topic 1	1	3		3		Department of Mathematics and Statistics	

27	GTCĐ	527	Research Topic 3	2	3		3		Department of Mathematics and Statistics
28	GTCĐ	528	Research Topic 3	3	3		3		Department of Mathematics and Statistics
29	GTCĐ	529	Research Topic 4	4	3		3		Department of Mathematics and Statistics
III. Master's Thesis									
30	GTLV	530	Master's Thesis	4			12		Department of Mathematics and Statistics
Total credits					60				

10. TENTATIVE TEACHING PLAN

No.	Course Code	Course Name	NO. of credits	Semester				Proposed Instructor(s)	Managing Faculty
				1	2	3	4		
I. General Knowledge			3	3	0	0	0		
1	TNTH501	Philosophy	3	3				Department of Political Theory, Law, and Public Administration	Department of Political Theory, Law, and Public Administration
II. Fundamental and Specialized Knowledge			45	13	14	15	3		
II.1. Compulsory			27	10	11	6	0		
2	CSBB502	Advanced Linear	3	3				Dr. Lê Thanh Hiếu	

		Algebra					Dr. Trần Đình Lương	Department of Mathematics and Statistics
3	CSBB503N	Advanced Algebra	2	2			Dr. Phạm Thùy Hương	Department of Mathematics and Statistics
							Dr. Nguyễn Bin	
4	CSBB504	The theory of functions of real variables	3	3			Assoc. Prof. Dr. Lương Đăng Kỳ	Department of Mathematics and Statistics
							Dr. Mai Thành Tấn	
5	CSBB505N	Probability Theory	2	2			Dr. Lâm Thị Thanh Tâm	Department of Mathematics and Statistics
							Dr. Cao Tấn Bình	
							Dr. Nguyễn Đăng Thiên Thư	
6	CSBB506N	Introduction to Algebraic Geometry	2	2			Assoc. Prof. Dr. Lê Công Trình	Department of Mathematics and Statistics
							Dr. Phạm Thùy Hương	
							TS. Nguyễn Bin	
7	CSBB507N	Applied Functional Analysis	2	2			Assoc. Prof. Dr. Thái Thuận Quang	Department of Mathematics and Statistics
							Assoc. Prof. Dr. Huỳnh Minh Hiền	
8	CSBB508N	Complex Analysis with Applications	2	2			Assoc. Prof. Dr. Thái Thuận Quang	Department of Mathematics and Statistics
							Dr. Nguyễn Văn Đại	

9	CSBB509	Optimization Theory	3		3		Assoc. Prof. D.Sc. Huỳnh Văn Ngãi	Department of Mathematics and Statistics
							Dr. Nguyễn Hữu Trọn	
							Dr. Nguyễn Văn Vũ	
							Assoc. Prof. Dr. Trần Ngọc Nguyên	
10	GTBB510N	Partial differential equations	2		2		Dr. Nguyễn Ngọc Quốc Thương	Department of Mathematics and Statistics
							Dr. Nguyễn Văn Thành	
11	GTBB511N	Convex Analysis	2		2		Assoc. Prof. D.Sc. Huỳnh Văn Ngãi	Department of Mathematics and Statistics
							Dr. Nguyễn Hữu Trọn	
							Dr. Nguyễn Văn Vũ	
							Dr. Hoàng Văn Đức	
12	GTBB512N	Dynamical systems and control theory	2		2		Assoc. Prof. Dr. Phan Thanh Nam	Department of Mathematics and Statistics
							Dr. Lê Quang Thuận	
							Assoc. Prof. Dr. Huỳnh Minh Hiền	
13	GTBB513N	Fourier analysis and applications	2		2		Dr. Lê Văn An	Department of Mathematics and Statistics
							Assoc. Prof. Dr. Lương Đăng Kỳ	

								Dr. Nguyễn Văn Thành	
II.2. Optional (select 03/12 courses)			6	0	0	6			
14	GTTC514	Harmonic analysis	2			2		Assoc. Prof. Dr. Lương Đăng Kỳ	Department of Mathematics and Statistics
								Dr. Dương Quốc Huy	
15	GTTC515	Special Functions	2			2		Dr. Lê Quang Thuận	Department of Mathematics and Statistics
								Dr. Nguyễn Tông Xuân	
16	GTTC516	Hyperbolic dynamical systems	2			2		Assoc. Prof. Dr. Huỳnh Minh Hiền	Department of Mathematics and Statistics
								Dr. Lê Quang Thuận	
17	GTTC517	Stochastic Analysis	2			2		Dr. Mai Thành Tấn	Department of Mathematics and Statistics
								Dr. Nguyễn Đăng Thiên Thư	
								Dr. Lâm Thị Thanh Tâm	
18	GTTC518	Integral Transforms	2			2		Dr. Lê Văn An	Department of Mathematics and Statistics
								Dr. Nguyễn Tông Xuân	
19	GTTC519	Numerical methods for solving systems of equations	2			2		Dr. Nguyễn Ngọc Quốc Thương	Department of Mathematics and Statistics
								Assoc. Prof. Dr. Trần Ngọc Nguyên	

20	GTTC520	Theory of Distributions	2			2		Dr. Lê Văn An	Department of Mathematics and Statistics
								Dr. Nguyễn Ngọc Quốc Thương	
21	GTTC521	Optimal Control Theory	2			2		Assoc. Prof. D.Sc. Huỳnh Văn Ngãi	Department of Mathematics and Statistics
								Dr. Lê Quang Thuận	
								Dr. Nguyễn Văn Thành	
22	GTTC522	Applied Statistics	2			2		Dr. Cao Tấn Bình	Department of Mathematics and Statistics
								Dr. Lâm Thị Thanh Tâm	
								Dr. Nguyễn Đăng Thiên Thư	
23	GTTC523	Topological degree theory and applications	2			2		Assoc. Prof. D.Sc. Huỳnh Văn Ngãi	Department of Mathematics and Statistics
								Dr. Nguyễn Văn Thành	
24	GTTC524	Variational Analysis	2			2		Dr. Nguyễn Hữu Trọn	Department of Mathematics and Statistics
								Dr. Nguyễn Văn Vũ	
25	GTTC525	Operator Theory	2			2		Assoc. Prof. Dr. Thái Thuần Quang	Department of Mathematics and Statistics
								Dr. Lê Văn An	
II.3. Research topics									

26	GTCĐ526	Research topic 1	3	3				Faculty Group in Mathematical Analysis and in Applied Mathematics	Department of Mathematics and Statistics
27	GTCĐ527	Research topic 2	3		3			Faculty Group in Mathematical Analysis and in Applied Mathematics	Department of Mathematics and Statistics
28	GTCĐ528	Research topic 3	3			3		Faculty Group in Mathematical Analysis and in Applied Mathematics	Department of Mathematics and Statistics
29	GTCĐ529	Research topic 4	3				3	Faculty Group in Mathematical Analysis and in Applied Mathematics	Department of Mathematics and Statistics
III. Master's Thesis									
30	GTLV530	Master's Thesis	12				12	Lecturers' from Faculty of Mathematics and Statistics; Invited lecturers outside of Quy Nhon university	Department of Mathematics and Statistics
Total credits			60	16	14	15	15		

11. GUIDELINES FOR PROGRAM IMPLEMENTATION

- **Applicability:** This training program applies to Master's students majoring in Algebra and Number Theory (Research-oriented curriculum) at Quy Nhon University, starting from the 2025 intake.

- **Online Instruction:** Certain courses within the program may be delivered via online learning, provided they do not exceed 30% of the total program workload and are proposed by the Managing Faculty.

- **Training Process:** The training process is based on the designed curriculum, educational objectives, target learners, human resource requirements, and specific training needs. For elective courses, the Managing Faculty will advise students on selecting appropriate modules based on current trends and societal demands.

- **Management Responsibility:** The Dean of the Managing Faculty is responsible for organizing and guiding the principles for program development and detailed course syllabi to ensure that objectives, content, and requirements are met, while satisfying the needs of learners and society.

- **Program Review and Update:** The training program shall be reviewed, evaluated, and updated in accordance with the current regulations of the Ministry of Education and Training and Quy Nhon University. This ensures the program remains aligned with the advancements in Algebra and Number Theory and meets socio-economic development needs.

12. DETAILED COURSE OUTLINES (APPENDIX)

Binh Dinh, April 29, 2025

RECTOR

Assoc. Prof. Dr. Doan Duc Tung